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CRITICISMS AND DISCUSSIONS.

THINGS ARE NOT ALWAYS WHAT THEY SEEM.

No man or woman is ever so much deceived by another as by himself or herself. The girl deceived by the lover, the rube fooled by the bunco-steerer, the merchant lured by the stock market, the fat gentleman with the bank roll duped by the sweet little maid, the lobster hooked by the salamander, are gulled less by the hocus-pocus, chicanery and deceit of the Salomes and Judases than by the tricks of their own thoughts.

Experimental psychology has contributed a large number of new discoveries which explain all this. Time was when philosophers, beetle browed, knitted and knotted in wrinkles, with ponderous spectacles and professorships, would sit in their garrets or hermitage and evolve some theory or notion to explain whether the world was made of green cheese, a blue fancy, or something real.

For tens and hundreds or thousands of years philosophers have fought French duels of wordy battles as to the existence of anything round about or not. To plain people, who have bumped their heads on door knobs or burned their fingers in a fire, it might seem the Olympus of folly to debate whether a piece of sausage and a dog are the flames from your heated imagination or something actual and real.

But philosophers are not supposed to be either plain or matter of fact. They are apt to pursue words and phrases, no less than thoughts, into all sorts of mazes and devious channels. If they at times run into a blind alley, a *cul-de-sac,* or against a stone wall, the matter is lightly dismissed with "we shall return to that later."

Experimental psychology takes neither philosophies, philosophers, innermost thoughts, or words seriously. This experimental science of the real world as distinct from the image of thought world may be likened to philosophy and the psychology of other years, as a man is to his reflection in a mirror.

The one is active, movable, changeable, up and doing, while the other is merely the reflected ray of light. One is the substance, the other is the shadow. One is a creature that acts upon and is acted on by everything round about. The other is uninfluenced by or uninfluencing the world.

In fine, laboratory, experimental, objective, and the "test" psychology of to-day, takes nothing for granted, admits no "authorities" other than real facts open to, admitted and acknowledged by ninety-nine and nine-tenths percent of sane persons. The older psychology of psychics, spirits, mind reading, telepathy, "seeing-things," "spiritism," and images and thoughts of isolated "professors," "mediums," "experts," "writers on malaria," "descendants of Oliver Wendell Holmes," and the like, are all found wanting by objective psychology.

Recently this refreshing science has undertaken to find out why everybody sees things, not as they actually and truly are, but each in a different way. It has been found for the first time that there is no such thing as a pure, unadulterated, accurate, unmixed sensation.

This will be a blow to physiologists, physicians, and medical men generally, all of whom still teach that when you see a bulldog with his teeth in the seat of a pedestrian's trousers, you really see what you think you see. Nothing else. This is a clean uncomplicated sensation you are falsely taught.

Philosophers of a certain ilk may teach, if they like, that when a saucer of milk is lapped up by a kitten, there never was any real milk there in the first place. They may hold to this superideal world of non-reality. That is not what these experiments of psychology show. What they do prove, however, is the fact that the eye, ear, and other sensation receivers and mouthpieces, as years advance from infancy upward, become moulded and impressed in such a way with repeated happenings of the past in such a wise that they have a real physical power of prophecy.

Coming events cast their shadows before simply because the eye, muscles, tongue and ear are set like a mouse-trap or like the trigger of a gun—to wit, to spring forward far beyond the needed requirement; to foresee and forehear, to forestall what one has seen and heard so often before.

In other words, if you see an automobile, a runaway horse, or a batted ball, although each one is entirely different and describes an absolutely new and distinct kind of motion, yet you will see it exactly as you have seen many others before it.

When you meet a new acquaintance you are prone to think you have met him before or see that he "looks the spitting image of a dear friend, Mr. Blank." I, myself, wear a Van Dyke beard and an imperial mustache. There are a score of men stouter, taller, shorter, darker, lighter, and with hair on their heads—I am well-nigh bald—who do not resemble me in the slightest, yet who are constantly told because they happen to wear beards—also unlike mine—that they look like me or I look like them.

That the ear is never true; that even Caruso, Farrar, Galli-Curci and the best musicians cannot hear sounds as they actually are, is easily discovered experimentally; that even those with a marvelous sense of hearing can never hear exactly what took place or what caused a particular sound, is proved in the laboratory. Little instruments that resemble brass helmets can be made to imitate bees, birds, the sighing of the wind through trees, the breaking of waves on a beach, thunder, roll of drums, violins, oboes, and so on.

Various sounds are made from these "resonators" and real bees, flies, parrots, musical instruments, and noises are also used. Any series of sounds used for some days previously leaves such an impress upon the subject's ears, that subsequent tones or noises are interpreted and heard almost before they are made, in terms of the sounds previously and formerly repeated.

It is a law of nature that light travels faster than sound. You can see a puff of smoke some time before you hear the shot. You can see the batter hit the ball some seconds before you hear the crack of the bat.

Yet you will find on analysis that bits from operas and songs that you hear hundreds of times a day, and other familiar and oft repeated tones are heard as quickly as you see. The experimental psychologist knows this to be another example of hearing things before they happen. This is true, scientific foresight due to habit, past experience, and multitudes of repetitions. The eye and the ear have become linked thus so often that the instant the eye sees a certain thing, the ear hears its necessarily associated sound. This fraction of a moment's anticipation or "prophecy" becomes fused with actual sound, which comes a moment later.

Echoes are often heard double for this reason. The sound is heard from habit and also as a later rebound. People who "see things" such as ghosts, spirits, and departed guests have much the same experience.

Seeing halos around the head; seeing people before you meet them—wrongly explained as coincidences or as something mysterious—are all due to the fact that you see the things which you have seen oftenest.

A patch of color, of light, and of shadow is usually all you see of anything. Yet you instantly recognize that distant blend as Larrie Jones or Goldie Summers; Don Quixote, who in Cervantes's novel charges and takes distant windmills for knights, is not a bit more amusing than the rest of humanity. Knights were in his thoughts as well as among his associates—at least in costume—hence he saw them.

There is but a slight difference between sane persons who see an orange when a yellow colored globe is thrown into the air, and the drunken man who sees rats without cause or the insane one who has the delusion that the veins on his arms are wriggling worms.

Indeed the only way you recognize a friend, a book, a doorstep, a fruit, a tree, or what not, is not altogether because of any sensation you receive at that moment, but from the past experiences, repetitions, and intimate memories of the past.

When you absentmindedly trace your steps home at night you may not be aware that past experiences are responsible for your seemingly rational behavior, but you have not consciously seen a house number, a doorstep, a post, a tree, or any of the landmarks which are needed to guide a stranger.

A dog, a cat, or a horse is no different from you. They find their way home, not because they see any peculiar home signs, but because they perceive a lot of complex, conglomerate things oft associated in their cosmos with that spot. A dog perceives his master, not by smell or sight according to Prof. John B. Watson of Johns Hopkins—as has been taught, but just as the master himself recognizes his children, namely, by a mixture of complex perceptions.

You turn corners, cross roads, avoid lamps as well as people, not because you see them, but because you perceive them. You may be talking to a companion, and at the end of your walk you may find yourself quite unable to recall a single moment when your movements were specially modified to suit an actual need, though you have probably accommodated yourself in this way many times. The frequency of past experiences of the kind has established what you have previously called a psycho-physical disposition which now works itself out on the occasion of the appropriate stimulus with the slightest intervention of consciousness. In like manner, an experienced teacher pursues the course of his lesson without any conscious effort to watch the more mischievous members of his class—yet no irregularity escapes his notice, or fails to produce a suitable though to the casual observer scarcely noticeable, response.

In the young child, all such dispositions are in the making. His mental life is therefore necessarily bound up very closely with his actual environment, as it changes from moment to moment. If he is walking in the road he must attend to the line of the footpath, the gas lamps and the people, or disaster would attend him at every turn. Repeated experience leads him to make the necessary muscular adjustments whenever he is about to step across the line of shadow or of light which marks the change of level from road to footpath, until finally the muscular changes take place with accuracy and precision with the exercise of little, if any, conscious control, whenever the situation demands it. This leaves the mind free to pursue any line of activity without reference to normal changes going on in the immediate surroundings.

You see then, how closely the process of perception is related to that which governs the formation of habits. It is possible only because of that fundamental quality of retentiveness which leads to the formation of psycho-physical dispositions. At the same time, it must not be supposed that the development of the perceptive powers is merely a development toward automatism.

The sensory bases upon which experiences rest are so slight that it is not surprising to find error creeping in, especially when perception takes place under the influence of unsatisfactory proofreaders. The thought and the particular phrases in which it is cast suggest the words before the eye reaches them. You tend to see what you expect to see, and miss the printer's errors. Under emotional influences, like that of fear, for example, such misinterpretations are particularly common. A nervous person walking along a country lane finds a miscreant's footsteps in the fall of every leaf, if you are waiting anxiously for a telegram, how many times do you hear the footsteps of the messenger and the sound of the door-bell!

Every slight sound is the occasion of such erroneous mental construction. It is clear, however, that illusions, which is the name given to misunderstandings of this peculiar kind, are not due to any inaccurate working of the nervous mechanism of sensation. The possibility of mistakes of the kind may perhaps be regarded as the price paid for the power which the accumulated but latent fruits of experience give to you in your perceptual adjustments. The sensory element in perception is often so entirely outweighed by those traces of the past which are involved in the process, that the actual sensory object is enormously modified or even practically replaced by something else which corresponds more closely to existing and very lively dispositions.

In both perception and illusion there is always present some sensory element and even those traces of past experience which are revealed when either process is subjected to analysis are also sensory in origin. Ultimately, then, the knowledge of the physical environment rests upon the evidence of the senses.

Every one knows what Bunyan meant when he wrote of the "five gateways of the soul," but increasing knowledge has taught that the traditional five senses do not exhaust the list. Perhaps the most important of the more recently discovered sensations are those which are due to the movements of muscles, tendons, and joints, which play so large a part in enabling you to gain control of your movements, sensations of heat and cold, other organic sensations from internal parts of the body and sensations of pain, all of which are due to the stimulation of nerve-structures specially adapted to respond to a particular type of stimulus. A visual sensation may be more or less bright, a sound-sensation more or less loud, a sensation of pressure may be more or less light and so on. These are differences in intensity. Again, visual sensations vary in color, sound-sensations in pitch, temperature sensations may be hot or cold and taste sensations may be sweet or salty, sour or bitter, These are typical of what are called qualitative differences, and the student will readily notice how much more delicately these differences are related in the case of light and sound than in the other cases.

It is particularly important that one should realize the difference between the sensation and the stimulus to which it owes its rise. Most people see sufficiently for all practical purposes, without knowing anything about vibrations of the ether or the change which they cause in the minute structures which lie in the sensitive layer of the retina. The psychologist is not directly concerned with either of these things. It is in seeing as you all experience it that he is interested. The physicist or the physiologist tells you that those other things happen and you accept his word for it, but you are not conscious of these events; they do not enter into the experience of the person who sees, in the way that color and brightness and light and shade do. These, then, are the sensory objects the apprehension of which he discusses. A like distinction is also to be drawn between all other sensory objects and the stimuli to which they owe their appearance in consciousness.

Moreover, in actual experience you never merely sense color for instance, but perceive a colored thing. The mental processes which are set up by sensory stimuli are always interpretative and therefore perceptual in character. Whenever you see, you see something. Ordinarily you can name or describe it. So with what you hear or touch or taste. But these interpretations had to be learned, except in so far as precise reflex machinery provided for right response to such stimuli.

In general, the tendency is to shrink from those contacts which produce discomfort, and to seek those which give satisfaction. This shrinking or seeking attitude which the infant learns to adopt toward objects around him is his first interpretation of his sense experience. Conscious purpose is still undeveloped, but when he hears a voice, his head turns, seeking, as it were, the visual sensations which usually accompany that sort of sound. His mental life is at first chiefly of this order. Increase of motor control greatly enriches his sensory experiences and deepens the significance of the things around him. In other words, percepts become fuller: color differences, differences in size and shape, position and distance are all perceived with gradually increasing accuracy; to sensory stimuli his reactions grow increasingly varied and delicate with these growing powers of discrimination. The process is especially rapid in regard to the things which afford him bodily comfort or with which he plays or which he otherwise puts to use. Instincts like fear and curiosity prompt experimental interpretations of new sensory experiences, but his action in these cases, even when most foolish, has its basis in what he has done previously.

In your own perception you will readily distinguish the dominant play of purpose. When you are thirsty, the cup of tea has only one aspect—a thing to take in the hand and carry to your mouth. When thirst is quenched, your china-collecting interest may assert itself, and the shape and design of the particular cup may strike your eye. If you want a certain book from your shelves, to that and that only your eye is directed. You may not even notice that other books surround it. In a casual outward glance, the unfamiliar strikes you and excites a closer examination, but commonly your interests and purposes determine your perceptions. If you are enthusiastic about birds, every twitter catches your ear as you walk through country lanes and a new note instantly arrests your attention, while your friend the botanist sees nothing but the flowers in the hedge bottom.

What you call observation is precisely this purposeful attention to the things which strike your senses. You do at times give yourself over to casual and almost meaningless noting of the things that pass before your eyes, as you sit in a railway train for example. But this is not observation in the right sense of the word. If, on the other hand, by force of habit, or by specific intention you are on the lookout for special features in the changing landscape, geological, historical, or other landmarks, your survey is purposeful, you become observant. Under the influence of a particular interest, your perception becomes remarkably acute. The sailor sees land on the horizon long before the passengers on the ship, and the traditional red Indian can follow a trail through the woods which would defy the ordinary white man. Popular opinion is apt to ascribe the power of the red Indian to special acuteness of vision, but recent researches into the psychology of savage races throw considerable doubt upon this view. It seems more probable that experience, quickened by the necessities of the situation, has taught him just what to look for, and how to interpret what he sees. The same explanation is, in all probability, true of the sailor's quickness to see the coast line which may be fraught with danger, or the first sign of the nearness of home.

At the same time, the capacity for sensory discrimination may be improved by the formal training of graduated exercises. Within certain limits fixed by physiological conditions that vary with every individual, the delicacy of the ear is improved by exercises which necessitate discrimination in the pitch of musical notes. Similarly, you will find that regular practice will prove the power of "seeing" distances, or delicately adjusting your muscles to the handling ot a billiard cue. But improvement in sensory discrimination goes ahead much faster when you feel that something really depends upon it. In the life of the young child, formal training has usually no place. His sensory development is a product of experience, and of his growing sense of power among things which every day acquire new meanings for him. He has no established interests, but the objects about him have for the most part become familiar, in the first instance, as sources of pleasurable sensory activity. He has "played" with them; then he puts them to use on his own initiative and in original ways. Informally he "picks up" a great deal of practical knowledge concerning the physical properties of objects. He finds out that some things will break when they fall and others will not, that some things are hard and others soft, that he cannot carry water or milk as he carries a piece of wood, that his father's chair is heavier than his stool. He is already in the path of learning, but his experiences are disordered, and his actions are almost entirely prompted by momentary circumstances. His development will be marked by an increasing coherence in his behavior. His perceptions will come more and more into the service of purpose, gaining thereby in acuteness as well as in richness of content.

It is important to realize how relatively late the power to look at objects in an impersonal way develops. A child in the Kindergarten is interested in objects because of the part they play in his everyday life—not in their shape or color, or size, or in their relations one to another. The ordinary child of three or four who looks at a picture still sees the persons and objects upon it in isolation. If you ask him to tell you what he saw, you will learn that there was a man, and a girl, and a horse, and so on. The pictured objects are just representations of things that have entered into his own experiences, and nothing more. At five or six he is curious to know what is going on in the picture—he is interested in other people's doings as well as his own. A year or two later he will observe more particularly the relative position of objects and suggest reasons for things—"the man is sitting down on a stool and looks very tired"—"the sun is just peeping behind the hill and the man is going out to his work." "There is a clock by the window on the wall—it says half-past five." Last of all comes the tendency to notice the details of individual objects—what they are made of, their peculiarities of form and position.

The bearing of this upon the so-called observation lessons in school is clear. Internal factors and felt needs are the springs of successful activity on the part of the children, and when you talk of training a child's power of observation, you may profitably keep in mind the possibility of cultivating his powers of purposeful action, success in which will depend upon watchfulness and care in the use of his senses. When mistakes in observation really matter, they become relatively infrequent. Many of the school observation lessons are, psychologically considered, nothing more than a formal attempt to associate names to things or to the specific sensory qualities of things. Whether they are justified or not it is not the business of psychology to say.

At the same time, the psychological qualities of a good observer include something more than interest in and knowledge of the subject under examination. Interest in a subject is not infrequently accompanied by preconceptions which may even be strong enough to vitiate the observations altogether. Until Galileo's time, people believed that a stone of ten pounds weight would fall ten times more quickly than a stone of one pound. That was the current belief, and nobody thought of questioning it. Yet the actual fall of stones must have been watched many times in the interval, but it was only with difficulty that Galileo persuaded his contemporaries to look at facts in freedom from the bias of preconception. In a like way, every teacher of science knows how difficult it is to prevent the quite honest "cooking" of results which comes when a pupil knows beforehand what he ought to find. Hence to train observation implies also a training in intellectual honesty and serves to lay the foundation of a love of truth for its own sake, which enables one to recognize facts whether or not they are in accordance with the preconceived ideas or hopes.

LIEUTENANT LEONARD KEENE HIRSHBERG.
JOHNS HOPKINS UNIVERSITY.

ON THE CONSTRUCTION OF A NON-ARISTOTELIAN LOGIC.

In a paper read at the Christmas meeting of the American Philosophical Association at Princeton University in December 1917,[1] the writer pointed out the existence of a group of logics, in which many of the implications of the traditional science become untrue.

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[1] See also the writer's *Primer of Logic,* (B. D. Smith and Brothers, Pulaski, Va., 1917).